

Unmanned Military Vehicles: Illuminating the Future of CBRN

軍用無人載具：化生放核未來展望(譯)

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By Staff Sergeant Jesus Ambrocio

作者：Jesus Ambrocio¹上士

譯者簡介



作者劉威廷中士，畢業於國立中正大學化學暨生物化學研究所碩士、陸軍化生放核訓練中心儲備士官班 104-1 期、參謀士官班 109-1 期、國防大學語文中心英語儲訓班、陸軍化生放核訓練中心士官高級班 109-2 期，現任化生放核防護研究中心戰劑化驗士。

The advent of unmanned military vehicles has developed into an explosion on the battlefield and, with it, has come an opportunity to radically change chemical, biological, radiological, and nuclear (CBRN) reconnaissance.

軍用無人載具在戰場上的大量應用，為化生放核偵察方式帶來巨大改變。

There is an established presence of unmanned aerial systems (UASs) on the battlefield, with the primary models of unmanned aerial vehicles (UAVs) being fixed-wing variants that provide intelligence, surveillance, and reconnaissance capabilities to commanders.

現今無人飛行系統(UASs)的運用，如改良定翼型無人空中載具(UAVs)，可提供指揮官情報、監視與偵察能力。

With decreases in UAV price and increases in their capabilities, there is a CBRN mission set suited for them.

隨著無人飛行載具成本降低及性能提升，已發展出對應的化生放核任務。

As the Army continues to test its Robotic Combat Vehicle–Medium2, unmanned ground vehicles (UGVs) will add additional capabilities to our

1. Staff Sergeant Ambrocio is an operations noncommissioned officer with the 84th Chemical Battalion, Fort Leonard Wood, Missouri. He holds a bachelor's degree in computer networking and cybersecurity from the University of Maryland Global Campus. Ambrocio 上士是美國密蘇里州倫納德伍德堡第 84 化學營的作戰士，擁有馬里蘭大學全球分校電腦網路及網路安全的學士學位。

2. Angelique N. Smythe, "DEVCOM Engineers Test RCV-M at Fort Dix, 4 August 2021," U.S. Army, <https://www.army.mil/article/249105/devcom_engineers_test_rcv_mat_fort_dix>, accessed on 11 April 2022.

formations. These emerging technologies will safeguard the lives of our Soldiers on the battlefield.

美國陸軍持續開發中型自動戰鬥載具(RCV-M)，無人地面載具(UGVs)可望為部隊添增額外戰力。這些新興科技將在戰場上保護著士兵的生命。

Fixed-Wing UAVs 定翼無人飛行載具

Fixed-wing UAVs, commonly known as “drones,” have been present on the battlefield since 2001,³ with the U.S. Air Force fielding most of the units. These drones are operated remotely—sometimes from around the globe.

定翼無人飛行載具，通常被稱為「無人飛行載具」，戰場上的應用可追溯至 2001 年。美國空軍大部分的單位已有無人飛行載具的配賦，這些無人飛行載具可遠端遙控，甚至從世界各地操作。

The Army has used smaller fixed-wing drones, which are able to carry a simple payload and provide limited reconnaissance and surveillance; they are now being fielded by company size and smaller units. The training required to operate the smaller drones consists of only short, 10- to 30-day courses.⁴

現行陸軍使用體積較小、可搭載簡易裝置的定翼無人飛行載具，以提供有限的偵察與監視能力，並正朝著連以下層級配賦。此外，操作小型無人飛行載具僅需要 10 到 30 天的短期訓練。

When exploring possible CBRN capabilities of small, fixed-wing drones, the payload is key. Fixed-wing vehicles offer stable platforms on which to add CBRN detection equipment.

小型定翼無人飛行載具的酬載能力對發展化生放核應用而言是關鍵的因素。定翼無人飛行載具可作為穩定的平臺，搭載化生放核偵檢裝備。

Through the payload capabilities and short training time, fixed-wing platforms offer a proposition of great value to CBRN reconnaissance.

在化生放核偵察應用上，偵檢裝備的搭載與短時間的人員操作訓練，為定翼無人飛行載具帶來了許多價值。

3.Larry Greenemeier, “The Drone Wars: 9/11-Inspired Combat Leans Heavily on Robot Aircraft,” Scientific American, 2 September 2011, <<https://www.scientificamerican.com/article/post-911-military-tech-drones/>>, accessed on 11 April 2022.

4.Matthew Cox, “New Drone School Trains Young Soldiers to Survive Enemy UASs,” 30 June 2018, Military.com, <<https://www.military.com/kitup/2018/06/29/new-drone-school-trains-young-soldiers-survive-enemy-uas.html>>, accessed on 11 April 2022. 4. TM 3-6665-307-10, Operator’s Manual for Chemical Agent Detector Kit, M256 (6665-01-016-8399) and M256A1 (6665-01-133-4964, 1 September 1985.

Rotary-wing 旋翼無人飛行系統

Rotary-wing-based UASs are a more recent addition to the battlefield. As consumer and professional rotary-wing UAVs, or quadcopters, have appeared on the market, their military applications have become a multiplier in theorized multi-domain operations.

在無人飛行系統中，旋翼無人飛行系統在戰場上的應用較為新穎。隨著消費型、專業型旋翼無人飛行系統或四軸旋翼機在市場上出現，它們的軍事用途也更加多元廣泛。

For example, recent testing by United Kingdom Royal Marines demonstrated the capability of these systems to transport blood for transfusions to the front line.⁵ Quadcopters offer more unique flight capabilities than their fixed-wing counterparts; however, the flight time and range of quadcopters are limited.

例如近期英國皇家海軍已可透過這些無人載具系統，將血液運輸至作戰前線。相較於定翼無人飛行載具，四軸旋翼機雖有較佳的飛行性能，但受限於其飛行時間及範圍。

圖 1 旋翼無人飛行系統(四軸旋翼機)



The size of quadcopter payloads is also more restricted, which further reduces their capabilities. However, the ability to change the payload of quadcopters on demand offers units flexibility in conducting their missions.

四軸旋翼機的酬載能力有較多限制，進而影響其應用範圍。然而，可依單位任務特性需求，對其進行改良，增加其單位任務運用上的靈活性。

Continuing quadcopter software developments enable the orchestration of UASs swarms, the flexibility for multi-UASs synchronization, and a unique

5. “Drone Swarms Support Commando Forces Trials in a First for the UK’s Armed Forces,” Royal Navy, 17 July 2021, <<https://www.royalnavy.mod.uk/news-and-latest-activity/news/2021/july/17/210715-autonomous-advance-force-4>>, accessed on 11 April 2022.

tactical advantage for CBRN threat detection.

透過四軸旋翼機軟體功能的持續開發，為蜂群無人飛行系統(UASs swarms)的組織運用、同步操作多臺無人飛行載具的靈活性及化生放核偵檢發展都帶來新的契機。

UGVs 無人地面載具

In recent years, great strides have been made in the use of UGVs—the most notable of which was the use of UGVs for explosive ordnance disposal, as demonstrated during the Global War on Terrorism.⁶

近年來，無人地面載具的應用上已有相當成果——其中最引人注目的是在全球反恐應用中，可透過無人地面載具進行爆裂物處理。

As technologies improve, deployed systems have also improved. In 2019, the Department of the Army awarded a contract for 200 UGVs to fill varying roles. UGV platforms offer more robust payload capabilities than UASs.

隨著科技日新月異，無人地面載具的配賦已更加廣泛。2019 年，美國陸軍部配賦 200 部無人地面載具，以滿足各級任務所需。

Several detectors and samplers as well as weapons systems can be fitted onto a UGV.

相較於無人空中載具，無人地面載具有較佳的酬載能力，可在其平臺上搭載多個偵檢器、採樣器及武器系統。

Artificial Intelligence 人工智慧

Artificial intelligence (AI) has drastically changed how the Department of Defense views AI-enhanced systems, including unmanned military vehicles. And AI-controlled UASs and UGVs have, in turn, changed how we view AI on the physical battlefield.

人工智慧(AI)的發展，徹底地改變了美國國防部對軍用無人載具 AI 輔助系統的觀點。然而，AI 無人飛行系統及無人地面載具的應用，也同樣地改變了我們在實際戰場上對 AI 的認知。

Quadcopters can return to their point of origin if communications are lost or hold their position despite changing weather conditions. AI-controlled UGVs, which continuously adapt to their environment, can follow squad leaders across varied terrain.

6 Clay Dillow, “How a Decade of IEDs has Reshaped Bomb Disposal Tech,” Popular Science, 21 December 2011, <<https://www.popsci.com/technology/article/2011-12/eods-ten-year-toolbox-how-decade-ieds-has-reshaped-bomb-disposal-tech/>>, accessed on 11 April 2022.

即使在通訊不良或天候不佳等不利因素下，四軸旋翼機仍可返回其出發點。AI 無人地面載具可不斷地適應環境變化，因此，班長在其運用在不受地形限制。

As the complexity of AI-controlled systems increases, the number of operators necessary is reduced to one. This abstraction concept enables the orchestration of systems and results in the acquisition of advanced capabilities.

儘管 AI 系統發展日趨多元，但實際上僅需一人即可獨立完成操作。除有助於執行系統化組織應用外，亦可提高資訊獲取的能力。

The Future of CBRN Reconnaissance 未來化生放核偵察應用

Unmanned military vehicles offer the Chemical Corps new angles of approach for CBRN reconnaissance. Recent innovations in CBRN detection have resulted in miniaturized detectors and equipment, thereby increasing the potential use on unmanned military vehicle platforms.⁷

軍用無人載具為化學兵的偵察方式帶來新的觀點，近年來由於化生放核偵檢裝備的不斷精進，體積逐漸小型化，增加了偵檢裝備搭載於軍用無人載具上的可行性。

Key technological improvements enable UAVs and UGVs to carry the payloads required to accomplish CBRN mission sets.

為了使化生放核任務能夠遂行，關鍵技術在無人飛行系統及無人地面載具的酬載能力。

Live feeds of air, moisture, and explosive trace detection results offer the potential capability to integrate payload data with robust software packages to supply information to the tactical operations center and allow commanders the decision-making flexibility that is required in contested battlespaces.

可即時將空氣、水分及爆裂物的微量偵檢結果與資料庫進行比對，提供作戰指揮中心相關重要資訊，使指揮官得以在戰場上適時地下達決心。

In addition to CBRN detection systems, live video is also available via unmanned military vehicle platforms. This offers the command real-time visuals, adding even more capability.

除了化生放核偵檢系統外，亦可透過軍用無人載具獲取即時影像畫面，強化其戰場應用範圍。

7 Patricia Sabatini, "Teledyne FLIR's Pittsburgh Lab to Develop Chemical, Biological Detection Tool for Pentagon," Pittsburgh Post-Gazette, 7 February 2022, <<https://www.post-gazette.com/business/tech-news/2021/12/08/Teledyne-FLIR-s-Pittsburgh-lab-chemical-biological-detection-tool-Pentagon/stories/202112070122>>, accessed on 11 April 2022.

The reduced size of the CBRN detectors and equipment is accompanied by a reduction in overall package weight; in turn, shipping and transportation weights are also reduced, enabling smaller units to organically transport the systems without the need for external logistics.

化生放核偵檢裝備體積小型化的發展，重量減輕而無需額外的後勤單位協助運輸，因此可應用在更小作戰單位的任務上。

Moreover, the reduction in size of CBRN systems is also accompanied by a logistical reduction in the power draw. The Army stands to save money through the reduced logistical footprint.

此外，體積小型化的發展亦能減少電力耗損，節省後勤成本。

Our Corps is driving the effort for Army alignment with the framework outlined in the Army Modernization Strategy⁸ with new procurements of UGVs. The alignment is being completed concurrently with the upgrade of the Nuclear, Biological, Chemical Reconnaissance Vehicle (NBCRV) sensor suite. The latest upgrade implements modular functionality, enabling Soldiers to adapt according to their mission set.

因應打造現代化陸軍政策，化學兵正推動軍用無人載具的採購及核生化偵察車(NBCRV)偵檢裝備升級，以實現功能模組化，使士兵能在不同作戰條件下完成任務。

The capability that unmanned military vehicle platforms offer represents a unique opportunity for the Chemical Corps to provide its organizations with compatible capabilities that can integrate with Army systems at an affordable cost, while ultimately reducing harm to our Soldiers.

軍用無人載具在合理可行的成本下，為化學兵帶來與陸軍其他系統進行整合的機會，並降低戰場上的傷損。

As more systems are deployed and more lessons are learned, refinements of tactics, techniques, and procedures will modernize the way we fight and catalyze the Army vision of 2035.

隨著更多軍用無人載具系統的配賦、經驗學習、戰技及程序上的改進，都將使我們的作戰方式更現代化，並加速推動陸軍 2035 年的願景。

Working within the modernization framework, these systems will change our concepts, doctrine, and training. Procurement of the systems will change what we fight with as well as how we perform hazard response and detection.

在現代化陸軍政策下，軍用無人載具系統的應用及採購，除改變我們的觀念、準則及訓練外，也會改變我們的作戰編組及危害應變的偵檢方式。

The combination of these two lines of effort will generate education and

⁸ Army Modernization Strategy, U.S. Army, 2021.

development opportunities for Soldiers and leaders working in this new domain. Unmanned military vehicles are here, and they will continue to be an asset on the modern battlespace. How we make use of them will define our impact on the battlefield.

綜合上述成果，將為在這項新領域工作的士兵及領導者帶來教育及發展機會。軍用無人載具儼然成為並持續發展成現代戰場上的新利器，有效的運用軍用無人載具，將左右現代戰場上的局勢變化。